

# The CANES Initiative: Bringing the Navy Warfighter onto the Global Information Grid

*OPNAV N6 directed investigation of the Consolidated Afloat Networks and Enterprise Services (CANES) approach as a potential solution to reduce redundant IT infrastructure, provide net-centric capability across the afloat enclaves and allow the Navy to react to rapidly changing network demands.*

By Cmdr. Phil Turner



## The Dilemma

Some 10 years have passed since the U.S. Navy sought to fundamentally improve C4ISR, command, control, communications, computers, intelligence, surveillance and reconnaissance, capability and services for the Navy warfighter with the initial introduction of IT-21. The overall goal of these improvements was to increase C4ISR capability to be both flexible and cost-effective.

Flexibility implies that current C4ISR capabilities can be improved with the rapid introduction and integration of new technology and systems. Flexibility also implies that completely new C4ISR ca-

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The average age of a typical shipboard network is approaching seven years, with some ships struggling to support 12-year-old networks. While industry is currently refreshing technology on a four-year or faster cycle, the current Navy C4ISR refresh rate is clearly unacceptable and fundamentally unsustainable for military acquisition.

In terms of the cost of maintaining legacy (and often stove-piped) systems, the Navy will be unable to procure hardware and software spare parts in 10 years if we continue on the current path. The cost of current Navy C4ISR applications maintenance and support continues to grow to the point where these costs are negatively impacting the procurement of new capabilities. This negative cost impact is a direct result of divergent commercial and Department of Defense trends, where the DoD has not leveraged a commercial investment in technology.

The Navy is heading on a course where budgets will be increasingly consumed by the cost of maintaining legacy systems which gives us little of the flexibility the operational forces needs or desires. Due to the inherent way that Navy systems have been resourced and procured, the Navy has been unable to reduce information technology (IT) costs for tactical applications or to provide the degree of agility needed to support the warfighter with the capabilities that new C4ISR systems can offer. And, there is still an urgent and growing need for seamlessly connected C4ISR capability.

Experiences with fielded C4ISR systems have highlighted the urgent need for

greater flexibility of applications and faster delivery of capability to the warfighter. Operation Enduring Freedom and the initial phases of Operation Iraqi Freedom clearly demonstrated the overwhelming combat power that U.S. and coalition forces can bring to bear when supported by timely, precise information and modern collaborative technology. These operations were naturally conducted using our current C4ISR systems.

Current military operations continue to be executed within even more complex, uncertain and rapidly changing operational environments that defy straightforward C4ISR technology solutions. All indications are that this trend will not only continue but accelerate in the future.

Experience in the global war on terrorism has demonstrated the need for substantially improved situational awareness, increased agility and enhanced responsiveness to address emergent threats.

Additionally, there have been dramatically increased requirements for flexible and rapid information sharing with coalition maritime partners.

In summary, the Navy is not where it needs to be with regard to flexible, agile and cost effective C4ISR systems, and these needs are growing and becoming more complex.

## The Course to a Solution

Adoption of commercial industry trends and standards that move the Navy toward service oriented architectures (SOA) is one area where significant improvements in efficiency and agility are possible. Private business enterprises and their IT providers have implemented SOA not only to reduce software costs and increase code reusability, but also to fundamentally improve their ability to rapidly reconfigure IT systems to support changing business environments.

Numerous Fortune 500 companies

pabilities can be integrated into existing systems in a relatively seamless manner.

In the current resource-constrained environment, C4ISR systems must reduce costs by leveraging off-the-shelf commercial technology and commercial standards, supported by a wide private industry base. These visions have not been realized and the situation is worsening despite strong efforts throughout the Navy's FORCENet enterprise.

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have successfully moved in this direction over the past five years and have significant proven returns on investment and enhanced operational agility as their measures of success. Both of these benefits, cost savings and operational agility, are directly applicable to the military procurement and operational environments.

The private business IT model of SOA offers the Navy reduced life-cycle costs, greater speed to deployed capability, and the prospect of users being able to reconfigure systems and capabilities to support changing missions.

The capstone initiative of Consolidated Afloat Networks and Enterprise Services (CANES) was developed in collaboration with all the elements of the Naval NETWORK FORCEnet Enterprise (NNFE) as a framework to fundamentally enhance C4ISR capability delivery.

The concept behind SOA can be most simply defined as breaking larger software programs into smaller, reusable components of functionality with common, well-defined interface standards. These elements can then be reused either by another program, discovered by other applications, or even rapidly recombined to support changing operations. Some common examples of one type of SOA approach in the commercial sector are Web Services, such as those used by Google, Travelocity, Amazon and others.

Note, however, that there are numerous types of SOA that can be leveraged by the DoD that go far beyond Web services. SOA creates an environment that can allow the Navy to develop more “composable” solutions that can be adapted to changing environments. From a command and control perspective, SOA provides the ability to reuse processing logic, such as fusion algorithms or separate the visualization and presentation tiers of an application from the data management tier.

Separating system tiers creates a level of software reuse not present in current Navy systems. SOA does this by employing a num-

ber of standards at varying levels of maturity. Foundation standards such as XML for data definition or HTTP for transport are ubiquitous, while higher order technologies such as Business Process Execution Language (BPEL) or Universal Discovery Directory Index (UDDI) are presently less widely employed, but show significant potential to assist the DoD in interoperability challenges.

Despite the potential reduction in integration, development time and resources, fundamental software challenges remain unchanged in a SOA framework. Establishing good requirements and developing quality systems that address users’ needs remain the foundation of a good software solution. However, SOA does create an environment to develop more composable solutions that can rapidly adapt to changing environments.

From a C2 and ISR perspective, SOA provides a mechanism to reuse processing logic such as fusion and correlation algorithms. Furthermore, migrating to a service oriented architecture allows the DoD to leverage commercial industry IT investments and allows DoD developers to focus on those military unique challenges that the commercial sector will not solve.

The DoD has already launched a range of IT initiatives to move military acquisition programs in SOA direction. These initiatives are framed by the overarching concepts of the Global Information Grid (GIG) and the Net-Centric Operations and Warfare (NCOW) Reference Model. To bring SOA core services to the DoD, the Defense Information Systems Agency’s Net-Centric Enterprise Services (NCES) acquisition program will provide nine core enterprise services to support the migration of C4ISR and other applications away from hardware implementation to pure software functionality.

These nine core enterprise services are the software “plumbing” needed so that SOA application service elements can find each other, share data and combine as needed to achieve a mission objective. From a user’s perspective, C4ISR applications will no longer require integrated client-server hardware or even a single software program, migrating instead to small components of functionality, which can be combined on the fly to support operations and the insertion of new capabilities.

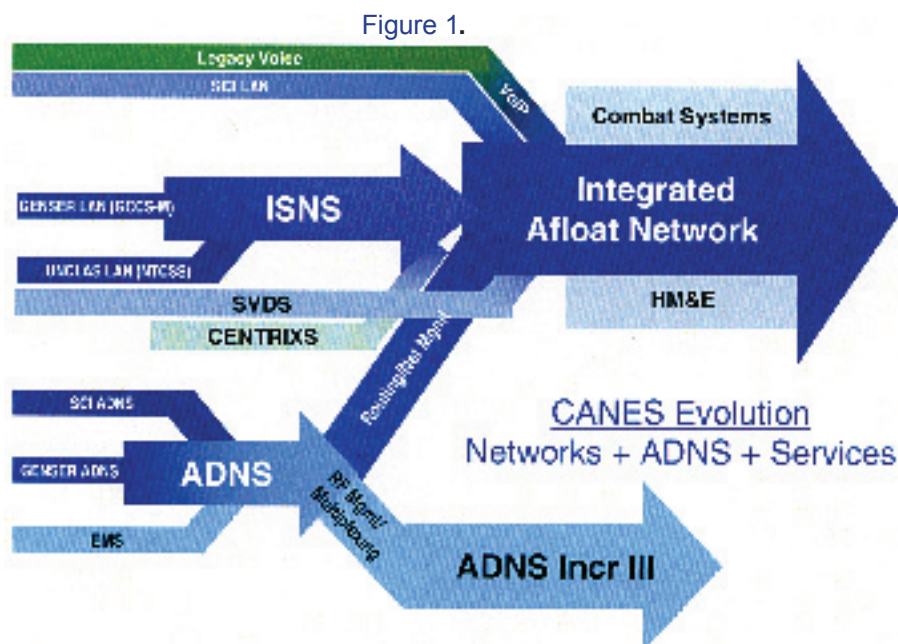
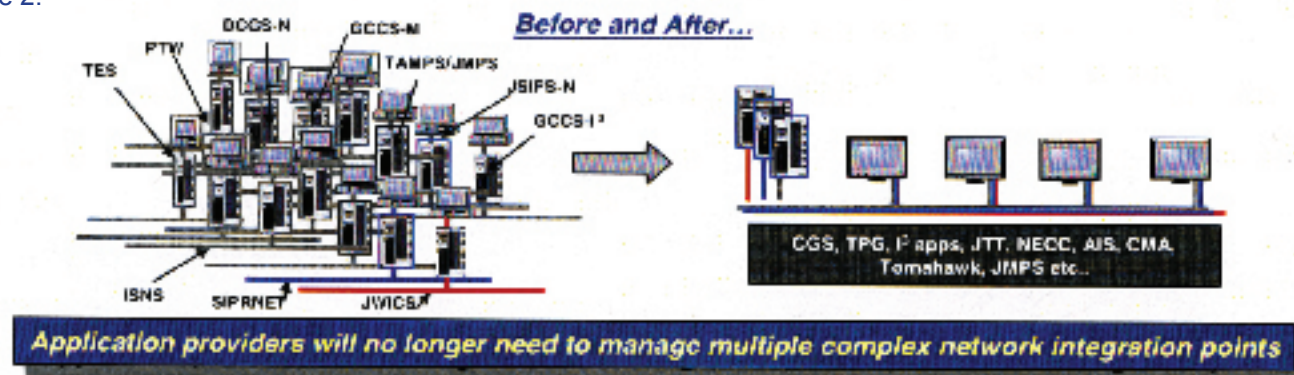


Figure 2.



## The CANES Initiative

Senior Navy leadership looked at the current unaffordable path of legacy applications and network acquisition — the divergent commercial and DoD trends previously discussed, and decided to make significant improvements to the way naval C4ISR capability is delivered to the warfighter.

The capstone initiative of the Consolidated Afloat Networks and Enterprise Services (CANES) was developed in collaboration with all the elements of the Naval NETWORK FORCEnet Enterprise (NNFE) as a framework to fundamentally enhance C4ISR capability delivery.

There are four primary components to the strategy underlying the CANES initiative:

- Consolidate and improve the networks on tactical platforms. There are four primary shipboard infrastructure networks today: NI-PRNET, SIPRNET, Sensitive Compartmented Information (SCI) and the Combined Enterprise Regional Information Exchange System (CENTRIXS), each operating at different security levels.

Additionally, many C4ISR applications bring their own unique networks and hardware. The average force-level ship has more than 50 separate networks deployed, all with significant installation, training and supportability issues. More importantly, these networks are typically not interoperable as they were each designed to support a single warfighting function, which is the origin of stove-piped systems.

The desired end state for the new CANES Common Computing Environment (CCE) network, supporting afloat and Maritime Headquarters with Maritime Operation Centers (MHQ/MOC), is a single suite of survivable common hardware capable of hosting a wide variety of near-real time combat support applications.

Cross domain solutions are being employed to reduce IT investment and, more importantly, allow for enhanced movement of data between different security domains on a consolidated network.

The CANES network will build from the lessons learned from current afloat networks to bring significantly increased reliability, capability, security and functionality to the fleet. The first

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infrastructure.

CANES program installations are set to begin in 2011. Figure 1 illustrates the CANES evolution.

- Accelerate the movement of DISA's NCES core services to the tactical edge. Moving GIG core enterprise services forward to the warfighter will be accomplished by developing a set of federated services to support tactical C4ISR applications in the disconnected, intermittent or limited-communications scenarios often experienced by naval warfighters.

These CANES core services will ride on the CANES CCE network for afloat platforms and ashore at the MHQ/MOCs. This configuration will allow tactical applications to migrate toward a more flexible and affordable service-oriented approach.

CANES represents the Navy's plan to provide afloat tactical and MHQ/MOC nodes on the GIG. This is critical because many new applications, such as DISA's Net-Enabled Command Capability (NECC), are being designed to ride on these core services.

- Modify existing C4ISR applications to leverage SOA. Modifying the operational requirements for numerous existing C4ISR applications will direct the delivery of capability via the more efficient and flexible SOA approach. This new approach will fall in line with commercial business IT trends and move away from the traditional DoD integrated hardware and software stack legacy systems.

This effort will be conducted as soon as technically feasible. There are, however, important financial, governance and technical challenges associated with managing this transition. But the risks of not beginning this transformation are greater still because the current path of procuring stove-piped systems and the support and maintenance of legacy systems have become unaffordable. In this fiscally constrained wartime environment, the sustainment of dozens of shipboard networks is no longer a possibility. Figure 2 above shows a before and after snapshot of CANES implementation.

- Immediately deploy elements of CCE and SOA into existing programs of record. In addition to the enhanced capabilities that will be delivered by CANES and C4ISR applications under



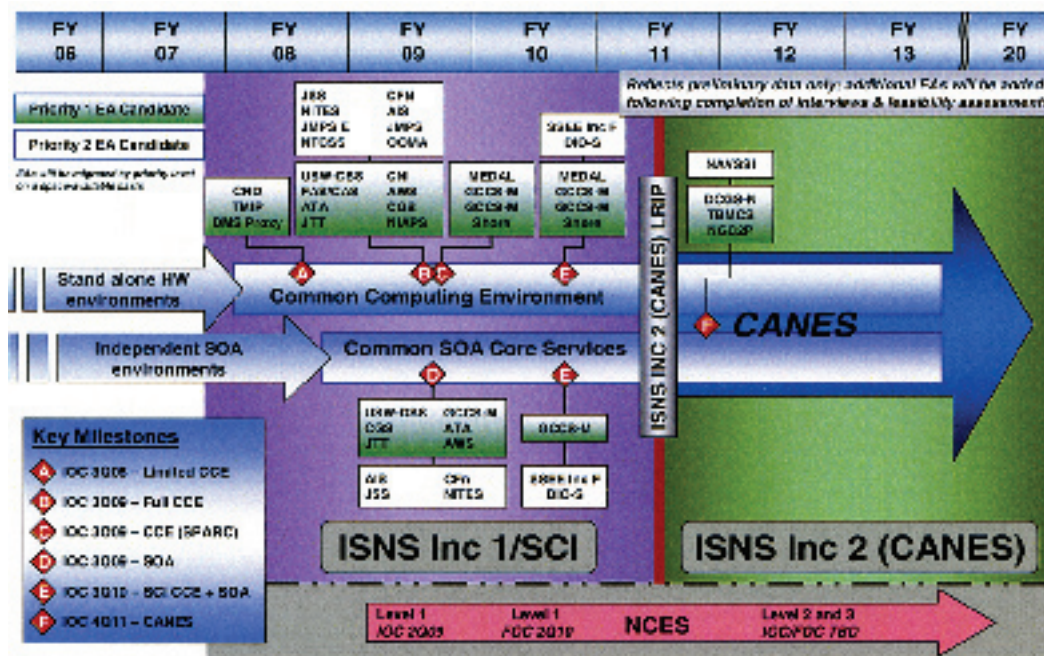


Figure 3. The timeline for CANES implementation. Navy leadership recognized that fundamental changes in the acquisition process are needed to keep the Navy aligned with DoD and commercial trends — and to provide continued support for operational forces. The CANES initiative is a significant step toward realizing this vision.

these initiatives, CANES will immediately begin moving toward these goals by deploying initial elements of the CCE and SOA approaches into existing network and application programs of record.

This early introduction will accelerate delivery of capability and reduce the development risk of the CANES initiative approach.

The Integrated Shipboard Network System (ISNS), Distributed Common Ground Systems (DCGS), Global Command and Control System-Maritime (GCCS-M) and Undersea Warfare-Decision Support System (USW-DSS) are some of the first programs that are moving in this direction, targeting 2009 for the first installations of CCE hosting and SOA-enabled functionality in the fleet.

To date, there are more than 35 of these CANES early adopter programs working to accelerate the delivery of capability to the fleet. Additionally, new systems, such as a Fusion Framework supporting maritime domain awareness and anti-submarine warfare missions, are under review to transition the DoD's extensive multi-sensor data fusion processing logic to a SOA framework for all systems to employ for improved warfighter situational awareness.

The emphasis of the CANES implementation approach is on common hardware, open standards and tight adherence to specifications by infrastructure providers and software applications. By focusing primarily on interfaces and standards governance, the Navy anticipates making CANES core services easy to access and use by both enterprise and tactical users. The Net-Centric Enterprise Solutions for Interoperability (NESI) methodology will be used throughout the development of CANES core services and associated applications to reduce technical risk and increase the reuse of software code.

As a primary component of the overall Program Executive Office C4I open architecture initiative, CANES is designed to allow legacy applications to easily migrate toward a next generation system design. Figure 3 provides a timeline for implementation of the service oriented architecture.

CANES was endorsed by the Deputy Chief of Naval Opera-

CENTRIXS, the Combined Enterprise Regional Information Exchange System, provides allied and coalition forces with information services such as e-mail, Web services, collaboration and products such as Global Command and Control System Integrated Imagery and Intelligence components for the Common Operational Picture, Common Intelligence Picture, near-real time intelligence and integrated imagery. The primary role is a secure coalition network enabling coalition partners to utilize command and control for the global war on terrorism, coalition operations and exercises and humanitarian relief operations.

The program is managed by the Networks, Information Assurance and Enterprise Services Program Office, which reports to the Navy's Program Executive Officer for C4I.

tions for Communications Networks (N6), Naval Network Warfare Command and PEO C4I as the best way to provide tactical users with an agile, open, advanced and affordable computing infrastructure.

Additionally, CANES core services will be the enabling capability for Navy C4ISR mission application providers to bring the true transformational capabilities required to fulfill warfighting and acquisition objectives. Navy leadership has recognized that fundamental changes in the acquisition process are needed to keep the Navy aligned with DoD and commercial trends — and to provide continued support for operational forces. The CANES initiative is a significant step toward realizing this vision.

For more information about the Program Officer for C4I, go to the SPAWAR Web site at [www.spawar.navy.mil](http://www.spawar.navy.mil).

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